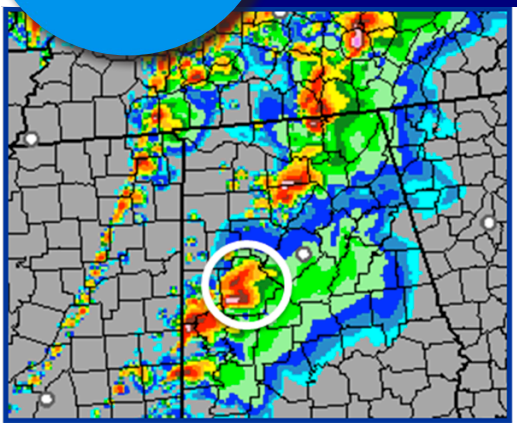
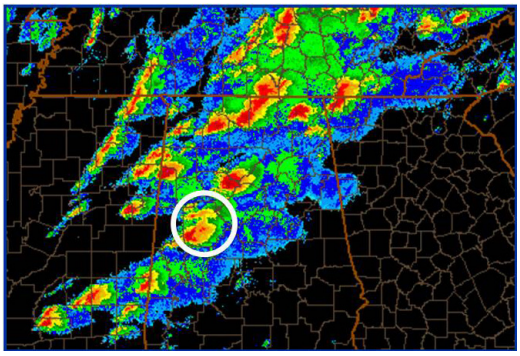
Earth System Research Laboratory (ESRL)
Global Systems Division (GSD)

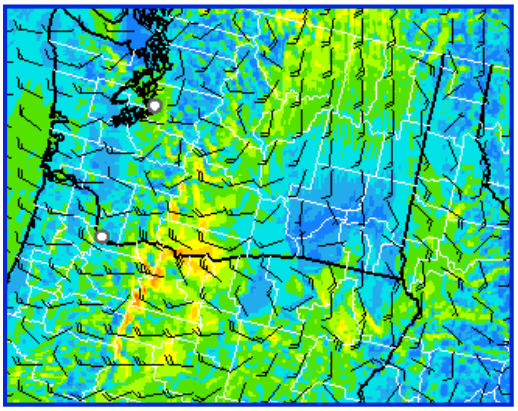
Putting tools in the hands of users
Precise Weather Guidance for the Next Generation



HRRR 9-hour forecast of thunderstorms for the April 27th, 2011 Southeastern U.S. tornado outbreak. Some individual tornadic storms (including the Tuscaloosa storm indicated by the white circle) are predicted with county-scale accuracy.



Observed thunderstorms at 5 PM CDT during the April 27th, 2011 Southeastern U.S. tornado outbreak. The Tuscaloosa tornadic storm cell is indicated by the white circle.



HRRR 12-h forecast 80-m wind speed and direction over Pacific Northwest region, showing strong winds through the Columbia River Gorge. HRRR 80-m wind forecast are potentially very helpful for anticipating wind energy ramp events.

High-Resolution Rapid Refresh (HRRR) Our nation increasingly needs detailed, reliable weather guidance to enable the commerce and transportation that drive our economy and the warnings that save citizens' lives and increase public safety. With the High-Resolution Rapid Refresh (HRRR) weather prediction system, ESRL scientists have merged advances in weather prediction science and high performance computing technology with a breakthrough technique for using radar data to achieve a new standard for up-to-the-minute weather forecasting.

Why Develop the HRRR? The experimental HRRR system has already proven itself in a myriad of weather forecast applications:

- increasing efficiency and safety for aviation and other transportation sectors
- helping to save lives in tornado and severe weather outbreaks, snowstorm and flood events
- providing needed high-resolution forecasts to enable wider use of renewable energy sources

HRRR Science and Technology Breakthroughs

The HRRR would not exist without recent scientific advances and breakthroughs:

1. Data assimilation and modeling; a set of complex computer procedures that blend the latest weather obervations together and then predict future hazardous weather
2. High-Performance Computing; ESRL's work to build extremely cost- effective large supercomputing systems and ongoing work on Graphical-Processing-Unit (GPU) technology
3. Use of Radar Data: ESRL scientists found a new way to use Nexrad radar data in the HRRR model, leading to further increase forecast skill.

ESRL scientists are working with The National Severe Storms Laboratory to add "Warn-on-Forecast" capabilities into the HRRR and to create accurate probability forecasts from an ensemble of HRRRs. This work requires ongoing research and supercomputing support.

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